

CLAIMS

5 I claim:

1. A die system for extruding plastic products, said plastic flowing through a passage constructed in a series of assembled modules and extending from an upstream inlet
10 to a downstream outlet, said products being formed in accordance with the cross section of the outlet of the system, said die system comprising:

at least one distribution module having a plurality
15 of distribution channels constructed therein to form a portion of the die system passage, each of said distribution channels constructed to supply a portion of the plastic flow according to a predetermined ratio of the distribution channel cross section to the die system
20 outlet cross section;

a die module having an extrusion passage constructed therein to form a portion of the die system passage to receive flowing plastic from said distribution channels
25 and to extrude said plastic through the outlet of said die system to form the extruded product; and

wherein said die system outlet cross section is divided into preselected flow regions and at least one of
30 said distribution channels provides plastic flow directly to one of said flow regions, and further wherein the area of said at least one distribution channel is determined by the ratio of the cross sectional area of the preselected region supplied thereby, to the cross

sectional area of the die system outlet.

2. A die system for extruding plastic products, said plastic flowing through a passage constructed in a series of assembled modules and extending from an upstream inlet to a downstream outlet, said products being formed in accordance with the cross section of the outlet of the system, according to claim 1, wherein said die system further comprises:

at least one transition module having a plurality of transition channels constructed therein to form a portion of the die system passage, said transition channels communicating with said distribution channels to receive flowing plastic therefrom, said transition channels constructed to supply flowing plastic to one of said preselected flow regions of said die system outlet.

3. A die system for extruding plastic products, said plastic flowing through a passage constructed in a series of assembled modules and extending from an upstream inlet to a downstream outlet, said products being formed in accordance with the cross section of the outlet of the system, according to claim 1, wherein at least one of said distribution channels forms an independent regional flow stream, and wherein said regional flow stream is independently supplied with a different material for forming a component of the extruded plastic product.

4. A die system for extruding plastic products, said plastic flowing through a passage constructed in a series of assembled modules and extending from an upstream inlet to a downstream outlet, said products being formed in

accordance with the cross section of the outlet of the system, according to claim 1, wherein each of said distribution channels is constructed having a smaller cross section than the immediately upstream portion of said die system passage to create a funnel effect from said inlet to said outlet within each of the regional flow streams formed thereby.

5. A die system for extruding plastic products, said plastic flowing through a passage constructed in a series of assembled modules and extending from upstream inlet to a downstream outlet, said products being formed in accordance with the cross section of the outlet of the system, as described in claim 1, further comprising multiple, axially assembled, distribution modules wherein the number of distribution channels in adjacent downstream distribution modules is enlarged in predetermined steps to provide at least one distribution channel for each of said flow regions.

6. In an extrusion die system for extruding a plastic product, a passage for carrying flowing plastic, extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile which is divided into preselected regions, said passage comprising:

a series of distribution channels, each channel designed to supply a regional plastic flow according to the volume of plastic required in one of said preselected regions of said cross sectional profile; and

an extrusion channel communicating with said

distribution channels to receive flowing plastic therefrom, and designed to extrude the plastic into a product having said cross sectional profile.

5 7. In an extrusion die system for extruding a plastic product, a passage for carrying flowing plastic, extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile which is divided into preselected regions, said passage,
10 according to claim 6, further comprising:

15 a series of transition channels communicating with said distribution channels, and designed to direct said regional plastic flow to one of said preselected regions.

20 8. In an extrusion die system for extruding a plastic product, a passage for carrying flowing plastic, extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile which is divided into preselected regions, said passage, as described in claim 6 wherein at least one of said regional flow streams is independently supplied with a different material for forming an individual component of
25 the extruded plastic product.

30 9. In an extrusion die system for extruding a plastic product, a passage for carrying flowing plastic, extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile which is divided into preselected regions, said passage, according to claim 6, wherein each of the connected distribution channels is constructed having a smaller cross section than the immediately upstream portion of

said passage to create a funnel effect within each of the regional flow streams formed thereby.

10. In an extrusion die system for extruding a plastic product, a passage for carrying flowing plastic, extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile which is divided into preselected regions, as described in claim 6 wherein said passage further comprises:

a plurality of axially assembled distribution modules, each of said modules having distribution channels constructed therein, wherein the number of distribution channels in adjacent downstream distribution modules is enlarged in predetermined steps to provide at least one distribution channel for each of said flow regions.

11. In an extrusion die system for extruding a plastic product, said system having a passage for supplying a flow of plastic extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile consistent with the cross section of the extruded product, a method of constructing an extrusion die system comprising the steps of:

analyzing said cross sectional profile to identify regions having predetermined flow requirements;

dividing the area of the cross sectional profile into said flow regions for the purpose of directing the supply of plastic;

calculating a ratio for each of said regional areas equal to the regional area divided by the total area of said cross sectional profile;

5 constructing at least one module for dividing the flow of plastic into multiple distribution channels for supplying a flow volume to a flow region in proportion to the ratio calculated for said region;

10 constructing a die module for forming the downstream outlet of the extrusion die system ; and

15 interconnecting said modules to supply the plastic flow to the outlet in alignment with the flow regions.

20 12. In an extrusion die system for extruding a plastic product, said system having a passage for supplying a flow of plastic extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile consistent with the cross section of the extruded product, a method of constructing an extrusion die system, according to claim 11, further including the step of constructing a transition module
25 having transition channels constructed therein for receiving the flow of plastic from the distribution channels and directing said plastic flow to said flow regions.

30 13. In an extrusion die system for extruding a plastic product, said system having a passage for supplying a flow of plastic extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile consistent with the cross section of

the extruded product, a method of constructing an extrusion die system, according to claim 11, wherein at least one of said regional flow streams is independently supplied with a different material for forming a component of the extruded plastic product.

14. In an extrusion die system for extruding a plastic product, said system having a passage for supplying a flow of plastic extending from an upstream inlet to a downstream outlet, said downstream outlet having a cross sectional profile consistent with the cross section of the extruded product, a method of constructing an extrusion die system, as described in claim 11, wherein each of the distribution channels is constructed having a smaller cross section than the immediately upstream portion of said die system passage to create a funnel effect within each of the regional flow streams formed thereby.

15. A method of supplying flowing plastic to an extrusion die having a profile consistent with the shape of an extruded product, said profile having identified regions of predetermined flow requirements, said method comprising the steps of:

dividing the flow of plastic into an independent stream for each of the identified regions in proportion to the relative area of said identified region to the total area of the die profile;

delivering each of said independent streams to its associated identified region for extrusion through the die.

16. A method of supplying flowing plastic to an extrusion die having a profile consistent with the shape of an extruded product, said profile having identified regions of predetermined flow requirements, as described in claim 15, comprising the further step of independently supplying at least one of said regional streams with a different material.

17. A method of supplying flowing plastic to an extrusion die having a profile consistent with the shape of an extruded product, said profile having identified regions of predetermined flow requirements, as described in claim 15, further comprising the step of gradually reducing the cross sectional area of the independent streams to provide a funnel effect.

18. An extrusion die having a passage for carrying plastic from an upstream inlet to a downstream outlet, to extrude plastic products in a specified profile comprising:

a plurality of identified flow regions which form part of the specified profile having predetermined plastic flow requirements;

a plurality of axial assembled distribution modules, each of said modules having an array of distribution channels constructed therein, said array of channels expanding in number in predetermined steps from an upstream module to an adjacent downstream module, to provide at least one flow channel for supplying plastic to each of said identified flow regions.

19. An extrusion die having a passage for carrying plastic from an upstream inlet to a downstream outlet, to extrude plastic products having a specified profile, according to claim 18, wherein the number of channels in
5 an array doubles from an upstream module to its adjacent downstream module.